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PRESIDENT'S ADDRESS

SOUTHWESTERN SOCIETY OF ORTHODONTISTS

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I WISH to say that the past year has been pleasant in my capacity as President of your Southwestern Society of Orthodontists, but this paper has caused some hours of concern. I have looked forward to this meeting in Lubbock for several reasons, but mainly for its opportunity to thank each member of our Society and especially the Program Committee, the Local Arrangements Committee, the Board of Directors, and our most efficient Secretary for the needed advice and cooperation. I have never been so closely associated with such willing workers, and now I can easily understand why our Society has progressed. With such men as these to guide us, we have no alternative but "forward march." I have not called on one single individual for help and received any answer but the most willing to cooperate. Unless a body of men can work and cooperate in such a manner, we cannot achieve our goal which will always be better orthodontics.

In such trying times I am sure our thoughts are more or less torn between a number of objectives, but if ever we needed progress and constant thought it is now. We orthodontists as individuals may be called on any day to add our bit in National Defense, and I urge each of us to keep this thought in our minds, so that if and when we are called upon we can continue to achieve and give of the best of our prized profession. I say prized because I feel confident that we would not have devoted our time, energy, and many of us our lives to a subject we did not hold high and prize.

The "healing art" has proved a great asset to our fighting ranks, and its importance is greater today than ever before. Our profession is well represented in the Army and Navy, and to me this has always brought a feeling of deepest pride. We hear much today about the National Defense Program. This

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means new opportunities for the orthodontist. The large percentage of rejections of young men for army duty are due to defects of the teeth, and many of these defects could have been prevented by orthodontic services. The records show that a large percentage of cadets at West Point and Annapolis had to have orthodontic corrections before they could enter these institutions. We must prepare for the opportunities that lie ahead. Our services are available, but we must let the public know more about orthodontic benefits.

I recommend that our Society go on record commending the outstanding work being done by the Public Relations Committee of the American Association of Orthodontists. These articles have reached a group of people who have never known of orthodontics and its benefits before. In turn these articles have been read and discussed before parent-teacher groups and other clubs in many sections of the country.

I recommend that a committee be appointed to supplement this work further in our local districts; the cost of which should be borne by the local orthodontists but handled through a central committee.

I recommend that this Society purchase a lantern and screen to be used by the Society, and this equipment to be delivered to the incoming President following each meeting.

As to the recommendations or changes in our Constitution and By-Laws I have no radical ones to offer. There are some minor changes to be made, but these will be brought before the Society by the Constitution and By-Laws Committee at the proper time. I hope you will give these recommendations and changes due consideration.

Again permit me to thank you for your whole-hearted cooperation during the past several years that I have served as an officer of this society, and to thank you for honors conferred.

SOME METALLURGIC ASPECTS OF ORTHODONTIC MATERIALS

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INTRODUCTION

THE title of this paper might well be revised to read "Some Orthodontic Aspects of Metallurgic Materials," inasmuch as the metallurgist, when addressing a gathering of orthodontists, has the somewhat disconcerting task of avoiding the pitfalls of too great a theoretical abstraction in his subject matter, related to orthodontics though it may be.

Should his presentation become too involved in purely metallurgic considerations, then obviously, interest will be lost and many of the fine points presented may be overlooked. The only persons to benefit from the many hours of study and research may, very possibly, be his fellow metallurgists.

With this thought in mind, some of the recent developments in laboratory and testing technique will be brought out, with particular emphasis on what may be of general import to the orthodontist's work. And to bring out these points in a logical manner, a clearer understanding of the position of a metallurgic laboratory in the orthodontic world might well be established.

For, it was in the laboratory that all of the various alloys employed by the orthodontist found their inception. They were evolved to their present high state of excellence through years of experimentation and research; and concurrent with this improvement in product, indeed the source and basis of it, has been the improvement in laboratory apparatus and testing procedures. So, as it is with these latter and their applications to your problems that this presentation is concerned, further detailed consideration will be given them.

DEVELOPMENT OF EQUIPMENT

The tensile test in the case of orthodontic materials is usually performed on an 18 gage (.040″) round wire specimen, upon which a 2 inch gage length has been marked. The elongation of this 2 inch gage length, expressed in percentage terms, is undoubtedly familiar as one of the results of the tensile test. Other reported results include the proportional limit, which is the greatest stress that a material is capable of developing without a deviation from Hooke's law of proportionality of stress to strain. Experience has shown that the value of the proportional limit, for any particular metal, does not vary widely from the value of the elastic limit. As a matter of practice, the definition of the latter may be accepted as that of the proportional limit, that is, the proportional limit (or elastic limit) is the limiting stress which a metal may withstand without any resulting permanent deformation on release of that stress. Or in other words, when a load is applied above the proportional limit, the material begins to elongate or deform.

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Another quoted result of the tensile test is the ultimate strength, which is the load at which fracture of the test specimen occurs. These terms, as given here, should by no means be accepted as definitive, but they will serve as an indication of their practical meaning.

Perhaps the most strikingly improved of the tools of the metallurgist is his microscope. A simple table microscope filled with a vertical illuminator for reflected light has ordinarily served very well for routine examinations of metal structures. However, recently it has given way to a complex metallograph which has become invaluable for research investigations.

Used to study the metal microstructures, it is capable of magnification up to 2,000 times. Both arc and tungsten illumination are provided, the former for photographic, and the latter for visual observation. Bright field, conical illumination, dark field, and polarized light may be used interchangeably, and photomicrographs may be taken either with the $3\frac{1}{4} \times 4\frac{1}{4}$ reflex camera, or with a 35 mm. Leica camera.

When suitably polished and etched, the crystalline structure of a metal is revealed under the microscope, as shown in Fig. 1, where we have at a magnification of 125 times the typical microstructure of a complex, gold-platinum wire.

In Fig. 2 the lines of cold work in a bent, etched, orthodontic wire are shown.

Keeping pace with the general improvement in laboratory apparatus has been an instrument known as a bend or stiffness tester. In 1923, Mr. R. V. Williams first brought out the possibility of its application to the study of orthodontic wires. They operated on the simple principle of a piston applying a load on a specimen wire which was supported on two fixed pivots. The amount of force necessary to produce a permanent bend on the wire was revealed and was used for comparative studies.

These early bend testers have given way to a modern electrically driven instrument, and it is with this apparatus that much of what is to follow is concerned. The theory upon which this bend tester operates is that of a simple cantilever, as shown in Fig. 3. A wire specimen of a standard gage, again 0.040″, is clamped firmly in a vise. When a load L is placed at a distance along the beam, a certain displacement or deflection of the wire results. Thus, the wire bends from position A to position B through an angle γ. If the load which is applied to the wire is increased, it follows that there will be a greater displacement or bending of the wire; as from position A to position C, through an angle β.

These few simple facts lay the basis for the operation of the bend testing instrument referred to above. The load is applied at one inch from the fixed grip, and as this load is slowly increased at a uniform rate for all specimens, the amount may be read on the upper of the two scales. The lower of these dials indicates the angular deflection, or the amount of bend which has resulted from the application of that particular load. As the load increases, the angle of deflection of the wire increases, and if these values are recorded and plotted on a graph, a curve of load vs. deflection results.

In the lower portion of this figure, there is shown what occurs when the wire, through proper application of load, is bent through 90°. As a standard procedure of the bend test, the load on a wire is increased until a 90° deflection results, at which instant the load is released entirely. Whereupon the wire springs back to a position of permanent deformation, from position *A* to position *B*. The angle of return which is noted from the tester is an accurate indication of the springiness of any particular wire. A soft ductile wire will have a relatively small "spring-back," while a stiffer, tougher wire, which may be called springier, would have a relatively greater angle of return from the 90° position.

Fig. 1.—Microstructure of wrought platinum gold alloy. (×125.)

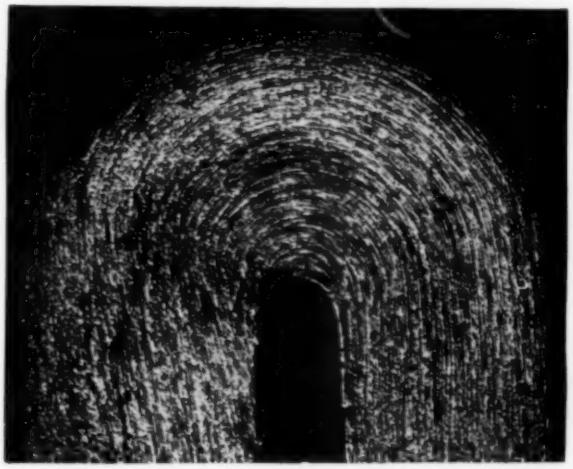

Fig. 2.—Bent wrought gold alloy. (×50.)

Thus, in review, the three most important testing instruments of the metallurgic laboratory have been reviewed, and just what it is that each of these has to offer has been shown. The tensile test gives the values for the proportional limit, the ultimate strength, and elongation. The microscope enables the examination of the internal microstructures of a metal, and the bend tester allows a determination of the stiffness and springiness of a wire.

COLD-WORK TEST

For orthodontic materials, the bend tester, although there has been comparatively little work done with it, has probably the greatest application of these three. It serves well as an approximation of the simple test that is performed with the hands, when a wire is bent to and fro in order to form a qualitative opinion of the merits of the wire. As a matter of interest, just what happens when the wire is bent back and forth? It is found that after a certain number of bends, each succeeding bend requires more force and finally the wire breaks. As the wire is being bent and manipulated, or, as the metallurgist would put it, is being "cold-worked," each succeeding bend hardens the wire more and more until a brittle state is approached and the wire fractures.

Many failures of arch wires in orthodontic appliances are caused by exactly the same effects of cold-work on the metal, as the appliance is moved and manipulated by either orthodontist or patient.

When a metal is cold-worked, the microscopic grain structure is refined. The grains or crystals are broken up and reduced as working continues, and as a result of the reduced grain size, the hardness and tensile strength of the metal are increased, with a corresponding loss in ductility or elongation. The resultant brittleness leaves the metal in a condition where it is easily fractured or cracked.

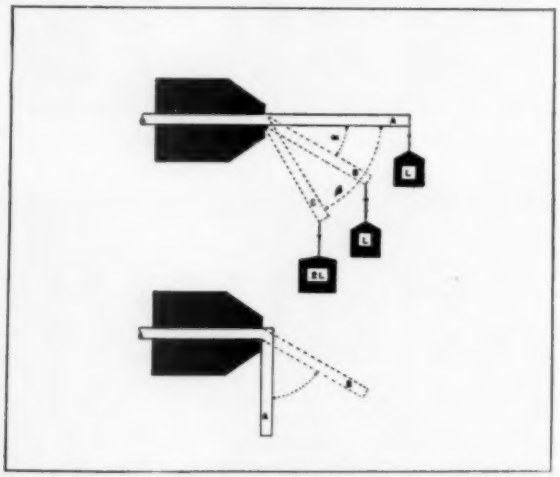

Fig. 3.—Principles of operation of modern bend tester.

This hardening and embrittling through cold-work do not proceed at the same rate in all metals. For instance, pure gold, tin, lead, and copper will withstand quite appreciable amounts of cold-working without ill effects, but other metals, and practically all alloys, harden materially at varying rates.

To arrive at a quantitative estimation of the effects of cold-working on any particular alloy, the metallurgist has to set up a scientifically rigorous scheme of testing. Such a test has to give results which are reproducible to a high degree and which may be readily interpreted.

First on the list of the requisites for such a test is a suitable specimen, to which definite and known amounts of cold-work have been imparted. For this, an annealed .040″ round wire is assumed as a reference standard and other wires

of a similar gage which have been varyingly cold-worked are used for comparison in the following manner.

In Fig. 4 a schematic representation of the drawing of the wires is shown. A wire of 0.080″ diameter is annealed and cold drawn without subsequent annealing down to 0.040″, a reduction of 100 per cent. Another wire, 0.076″ in diameter is similarly cold drawn to 0.040″, this reduction being 90 per cent. Other wires of varying diameters are also treated in the same manner resulting in eleven wires, all of 0.040″ diameter with cold reductions ranging from 0 per cent in the annealed specimen, up the scale with successive increments of 10 per cent, to 100 per cent. Thus, specimens are obtained which may be compared with each other on the basis of the amount of cold-working each has received.

The second requirement for the test involves quite naturally a suitable tester. The tensile tester was rejected, for while the results of this test give a clear indication of the condition of the metal, it is only rarely that an orthodontic appliance is subjected to tensile stresses. Rather, since transverse bending stresses usually prevail, the bend tester referred to previously is used.

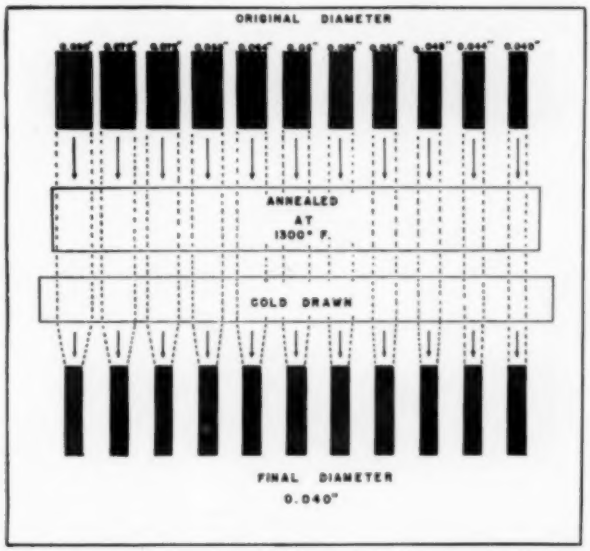

Fig. 4.—Schematic representation of cold reduction of wires.

On this tester, it will be recalled, a wire is bent by the gradual application of a load; and the values of that load and of the ensuing bend or angular deflections are noted. Plotted, they result in a chart such as is presented in Fig. 5. The wire under test in this instance is a 75 per cent gold-platinum alloy. As may be expected, the curve for the annealed reference specimen is the lowest of the four, and requires a lower load to produce any given bend or angular deflection than any of the other cold-worked specimens. A load of 1.2 pounds is required to produce a bend of 90° in this wire. For the specimen which had been cold-worked to an extent corresponding to a 10 per cent reduction in diameter, higher loads are required to produce given angular deflections; with a load of 1.7 pounds required for the 90° bend. Although data for the wires with the intervening 20, 30, 40, 60, 70, 80, and 90 per cent reductions were recorded,

they have been omitted rather than clutter the chart. Suffice it to say that they follow the general trend of increasing stiffness as shown by the specimens with 50 and 100 per cent reductions, respectively.

It may be noted that hardly, if ever, in general practice is a wire so severely stressed as the wire which had been reduced 100 per cent. Yet this wire was not so brittle that it could not be manipulated, or even drawn down farther. The range between the loads required to produce bends of 90° in the wire with a reduction of 100 per cent and the control specimen, respectively, is not a too great one, as will be seen by comparison with other alloys.

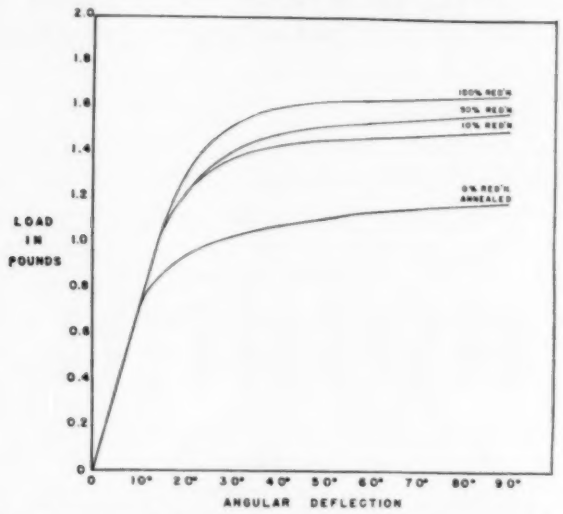

Fig. 5.—Load vs. deflection curves for cold drawn specimens.

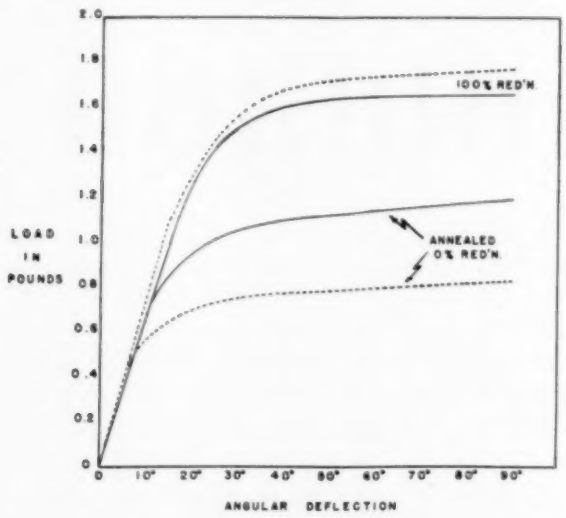

Fig. 6.—Comparison of stiffness ranges.

This range of increasing stiffness with increasing cold-work is a determining factor in deciding upon the satisfactory usefulness of a wire. Obviously unsatisfactory in that it stiffens and becomes embrittled at too great a rate is the wire, the bend tests for which are shown in Fig. 6. The curve, in dotted lines, for the

wire in the annealed state lies below that of the previous wire, similarly treated. Yet with a 100 per cent cold reduction, the curve is considerably higher and the range between the two correspondingly greater. Choosing between these two on the basis of these results, the metallurgist unhesitatingly discards the second as being unadaptable to orthodontic practice.

Referring back to the first of the alloys, the effects of cold reductions on the alloy are summed up in Fig. 7. Four of the various factors which have been noted are plotted against per cent reduction. The ultimate strength shows an increase from 103,000 pounds per square inch in the annealed control specimen to 154,000 pounds per square inch in the 100 per cent cold reduced specimen. This increase in ultimate strength is accompanied by a marked decrease in per cent elongation, from a value of 7 per cent down to 0 per cent, in specimens with cold reductions of 50 per cent or over.

The "bends" plotted on this chart refer to the number of times the wire was bent with a pair of pliers, or in other words, the old, somewhat haphazard bend test. These figures are included merely for the purpose of providing a familiar comparable test. The number of bends, as is to be expected, decreases linearly with increased cold-work, showing again increasing brittleness with cold reduction.

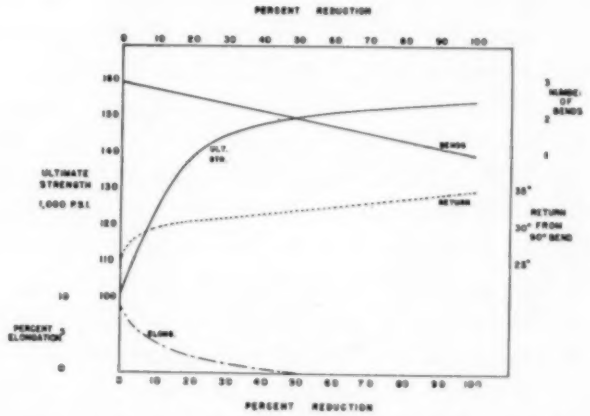

Fig. 7.—Effects of cold work on wrought wire alloy.

The increase of stiffness with increased cold-work is shown by the curve labeled "Return." This curve is given by the bend tester, when the specimen is bent to 90°, the load released, and the angle through which the wire returns is measured. As previously noted, the stiffer the wire, the greater the angle of return. And, as the curve indicates, the stiffness of the wire is greatly increased by cold working.

Thus the metallurgist has, as represented by the curves on this and the preceding charts, a means of determining exactly what cold-work does to any particular wire; knowledge which rounds out the other facts known about the alloy. It may now be determined, just how much the tensile strength is increased, the elongation reduced, and the stiffness increased with increased cold-work, and it is this quantitative knowledge which enables the metallurgist to better adapt particular alloys for particular usages.

For an example of the use to which these tests may be put, the development of a lock wire may be cited. Probably the most desirable feature for a wire of this sort is an ability to take a lot of punishment in the form of bending and rebending. It has to retain its ductility and pliability in the face of varying amounts of cold-working.

After several trials, the wire chosen for this purpose had the following properties. It did not heat treat, that is, no hardening or loss in pliability resulted from the heat of a soldering operation, and it might be soldered to safely, as its fusion temperature at 1950° F. affords a considerable margin of safety.

And now as to its resistance to embrittling under repeated bendings. As may be noted from Fig. 8, there are two sets of curves. The upper set are the bend curves for a wire that might well be used as an arch or spring wire, while the lower set of curves are for the lock wire. While the lock wire does work harden, as indeed every alloy must, the upper curve, representing the lock wire with the highest amount of cold-work (with a reduction of 100 per cent) still falls well below the curve for annealed specimen of the arch wire. In other words, the margin of safety for the lock wire is a great one, and the orthodontist should hardly fear a breakage in this wire, unless of course it is grossly mistreated.

In summation, the instruments of the metallurgist, the tensile tester, the microscope, and the bend tester, with several applications of each have been described. The detrimental effects of cold-work on metals have been discussed, and with these there has been presented a description of a method of quantitatively determining these effects. The value of this method to the orthodontist is a secondary one, in that it is primarily an aid to the metallurgist in formulating materials which are best suited to their particular functions. But, if these charts have served to bring out more clearly how working and manipulation may affect various appliances, they have indeed served well.

Before leaving this subject entirely it may be recalled that it was the refinement or decrease of the grain size which was the cause of the hardening and embrittling of the metal when cold-worked. In order to relieve the structural stresses of metal in such a condition, it is necessary to anneal it, or more properly to heat it to its recrystallization temperature. At this temperature, grain growth ensues, and the normal properties of the metal again prevail.

This indicates a solution to the problem of properly treating worked orthodontic structures. Just as it is wise to anneal to relieve stresses resulting from improper heat treatment, so is it good practice to anneal to relieve cold-working stresses. Of course, annealing should be carried out safely below the melting ranges of the solders used.

RADIOGRAPHIC EXAMINATION

Among the newer and more intriguing of the modes of testing is radiographic examination which has come into its own in the last decade as an efficient means of probing the internal soundness of metal structures. Particularly has this been so in the aircraft industry, where government specifications call for rigid x-ray testing of the castings that go into an airplane.

Similar specifications are set forth for high pressure boilers, and while it is a far cry from an aircraft plant or a boiler factory to the orthodontist's office, it will be shown how useful such x-ray testing may be.

As dentists who are familiar with radiography, you are undoubtedly aware of the fundamentals of the method in diagnosing defective teeth. Exactly the same procedure, with some variation of course, is used by the metallurgist to diagnose defective metals.

As is well known, x-rays, because of their short wave lengths, have the ability to penetrate through matter. However, in penetrating various materials, the intensity of the emergent radiation varies with the absorption coefficient of the material. Or more simply, all materials are not equally transparent to x-rays. Thus, if a beam of x-rays is passed through an object which is composed of parts with varying densities, a shadow record of these parts may be made upon a photographic plate or fluorescent screen

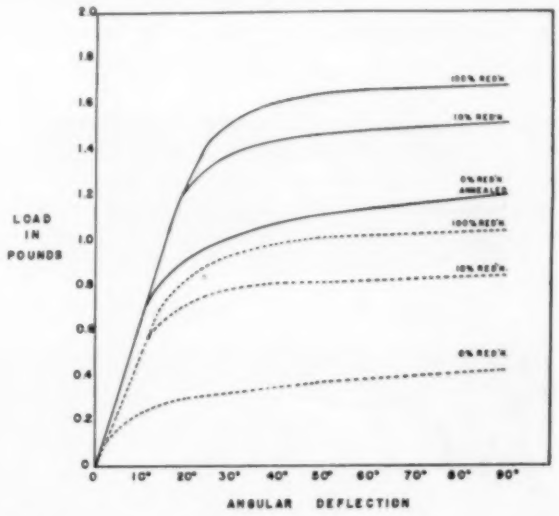

Fig. 8.—Comparison of lock wire with arch wire. Stiffness curves.

Radiographic examination, whether it be of a tooth, a lung, or a metal structure, consists therefore in noting the variation in densities throughout the material. A cavity, wherever found, whether in a tooth or in a metal, will appear as a dark portion on a photographic plate because of the greater penetration of the x-rays through the cavity than through the surrounding material.

It is at this point, however, that any further resemblance between clinical and industrial radiography ceases. For, as set up in the Commercial Testing Laboratory of the Bell Aircraft Corporation, the apparatus occupies a room with a volume of approximately 2,000 cubic feet and is completely lined with a $\frac{1}{8}$" layer of sheet lead. External controls manipulate a high tension transformer which is capable of producing up to 300,000 volts and 10 milliamperes. Most exposures, however, are made for varying lengths of time at 200 kilovolts and 6 milliamperes.

As in clinical diagnosis, the object to be examined is interposed between the x-ray tube, which in this apparatus is air-cooled, and the photographic film.

Mr. R. C. Woods, physicist, of the Bell Testing Laboratories, operated this equipment and is responsible for the general excellence of the radiographs presented here.

It is interesting to note, in discussing this topic, that whereas x-rays will penetrate through approximately 9 to 10 inches of the light metals, aluminum or magnesium, and through 6 inches of steel, it is extremely difficult to penetrate through more than about ¾″ of precious metal alloys. This, of course, is due to the fact that the precious metals, gold and platinum in particular, have relatively higher densities and absorb relatively higher amounts of the radiations.

Merely for the purpose of showing clearly how the variation in density of thickness of a metal is shown by x-rays, the radiograph shown in Fig. 9 was prepared. A strip of solder, 0.015″ thick, was stamped with some printed words; the stamped letters going about halfway through the metal. As the x-rays pass through the metal they are absorbed to a greater extent by the thicker metal surrounding the stamped letters and pass through these latter more easily. This results in a radiograph where the body of the metal appears light, in comparison to the printing, which is cast in sharp relief.

Fig. 9.—Radiograph of stamped solder strip.

Fig. 10.—Radiograph of orthodontic appliance on model.

In Fig. 10, the radiograph serves to bring out the same point. It shows a complete orthodontic appliance in place on a model, and since the latter is considerably less dense than the metal appliance, it appears only in dim outline. Since the metal has completely, or very nearly completely, absorbed the x-rays striking it, it appears with only a little variation in shading, and is considerably brighter than the model.

In the manufacturing plant with which the author is associated, x-rays have been used to examine the cast ingots from which orthodontic wires are drawn. This has resulted in an improvement in melting and casting procedures, as we

are able to check on the internal soundness of the ingot and to discard those procedures which gave unsound ingots.

After an alloy is formulated, it is melted, in our case in an induction furnace, and poured into a round ingot mold, approximately 3/8″ in diameter and 5″ long. The manner in which the metal is poured, the temperature of the metal at pouring, the condition of the flux, and the temperature of the ingot mold, are all important factors in producing sound ingots. If any of these factors is varied, the quality of the ingot is affected and therefore it becomes important to establish some standardization of these factors. A study of four ingots which were poured under varying conditions of the above factors showed that they appeared quite sound externally, with no distinguishing features to mark any one from the others. They all looked alike superficially.

Internally, however, they differ quite markedly as may be noted from the radiograph in Fig. 11. The dark oval spots on the lowest ingot represent tremendous voids or gas pockets, the largest of which occupies 5/6 of the diameter of the ingot. This and the other voids down the center make the ingot wholly unsatisfactory for the production of wire.

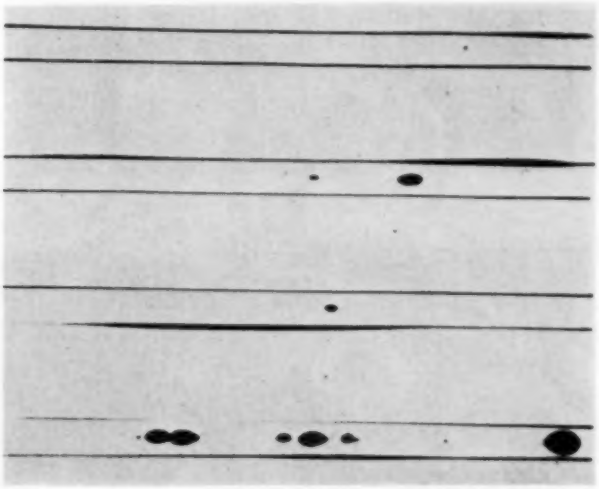

Fig. 11.—Radiograph of ingots prepared under varying conditions.

The third ingot suffers from similar porosity, but not nearly to the same degree. It is also unusable, while the other two may be used for wire. These two may be seen to be almost without imperfection down their entire length. When it is realized that many hours of work go into the manufacture of orthodontic wires, it becomes evident how important it is to start with a sound ingot. From an ingot of this size, approximately 30 feet of 18 gauge wire may be drawn, and if the original ingot is defective in any respect, it is a total loss as far as the labor and effort that went into its manufacture are concerned.

The appliance, a radiograph of which is shown in Fig. 12, has a multiplicity of soldered joints, and it was expected that some degree of unsoundness or porosity in at least one of these joints would be found. Although all of the soldered connections were in excellent condition, the two fractures on the arch wire were noted. Again in this instance, x-ray had discovered flaws that were not evident superficially.

More pointed as an object lesson to the orthodontist is the radiograph of the appliance shown in Fig. 13. It will be noted that there is a fracture in the arch wire immediately adjacent and anterior to the soldered post. This type of breakage is perhaps the most frequently occurring of any that is reported. Yet, as so many metallurgists before have emphasized, it is merely a matter of annealing to insure against such breakage. For if the soldering operation is followed by a slow cooling period, the arch wire will stiffen, losing its ductility. The resulting brittleness, aggravated by any subsequent manipulation, shortens the life of the wire immeasurably. Heating to a faint redness and immediately quenching relieves the stressed condition of the metal and cannot be too highly advocated as a proper heat treatment.

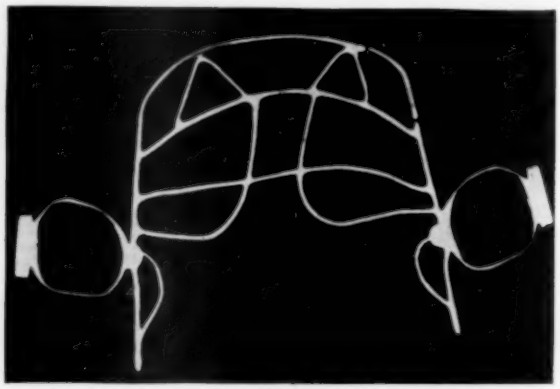

Fig. 12.—Radiograph of orthodontic appliance.

Fig. 13.—Radiograph of orthodontic appliance.

At the opposite lingual lock of this same appliance, it may be noted on the original radiograph that there is a considerable flaw in the solder attaching the post to the arch wire. Unfortunately, however, this flaw, which appeared as slightly larger than a pin-point on the original x-ray film, has been lost in the process of reproducing it.

Stress is laid on this point because it is believed that in its ability to examine soldered joints, the use of x-rays finds valuable practical application. Of unique importance is the fact that this form of examination is nondestructive and may be performed without damage on a finished appliance. On this basis

orthodontic appliances that are in use, or prior to being placed in use, may be examined for soundness or soldered joints. It may be possible to invite orthodontists to check up on their soldering techniques by preparing what they consider representative cases and submitting them for examination.

Also important is the fact that x-rays may be used to study various soldered joints prepared under a variety of techniques with different types of fluxing agents. Tests which are at present under way and as yet uncompleted, point to an increased efficiency in soldering with a particular type of additive to an ordinary borax flux.

These suggestions by no means exhaust the realm of possibilities for this newer type of testing. As research continues, and as ever, with the cooperation of the practicing orthodontist, many more applications of definite practical importance will be found.

CONCLUSION

In closing, it should be emphasized that metallurgic research is endeavoring to provide the orthodontist with the finest materials available. And with these materials, it is also placing at your disposal more and more complete information regarding their properties, with the suggestion that these data be used in a more astute selection of any material for any particular function.

The author would like to express his gratitude for the invaluable assistance and advice on matters, both metallurgic and orthodontic, given him by Mr. R. V. Williams, Dr. Myron A. Roberts, and Dr. Henry Spiller.

DISCUSSION

Dr. Sidney E. Riesner.—What factors would you recommend for taking pictures such as you suggested in the last part of your paper? The ones shown seem to be out of range to the normal accommodation of a dental x-ray machine.

Mr. Rose.—Unfortunately apparatus of the type required to take roentgenographs of this sort are found in relatively few places. The extremely high voltages and amperages required to penetrate through the dense metal structures require an apparatus which is available only in a few testing laboratories, and in this instance, in the testing laboratory of an aircraft plant. We have the cooperation of this plant and are glad to extend our cooperation in any effort of the orthodontist or the dentist to examine any of the structures that he might prepare in order to check up on his techniques. Unfortunately the dental x-ray equipment can attempt no such examinations.

Dr. Riesner.—Do you know the factors, what they are?

Mr. Rose.—The factors vary with the thickness of the metal, particularly in time. In taking these radiographs we used 200 kv., and an amperage of 6 milliamperes; and the time ranged from 10 seconds in a relatively thinner specimen to 15 and 20 minutes in a specimen which was relatively thick, so an examination of this sort is entirely out of the range of the orthodontist and the ordinary radiographic equipment.

Dr. Fred R. Blumenthal.—Mr. Rose, you spoke of the importance of the flux, and if I did not misunderstand your last reference, you said that some new ingredient that has been placed in the flux has greatly stabilized it. Is this ingredient being offered for sale, or is it something you can tell us about?

Mr. Rose.—It is something I can tell you about inasmuch as tests are being worked on in connection with it at present. The type of agent we are considering for use with

a borax flux is what an engineer would call a degreaser. It would tend to remove any oiliness from the metal parts to be soldered. We are working at present with several types of degreasers, checking up on the efficiency of the soldered joints resulting from the use of these degreasers. I might say in passing that some of the tests that we have made indicate greatly improved results in soldered joints by using these additives to the borax fluxes. It is not as yet on the market, and it will undoubtedly be some time before it is out on the market.

Dr. Harry E. Kelsey.—What other method did you employ before you used the x-ray for determining the quality, the internal quality, of your ingot, for instance?

Mr. Rose.—In determining soundness of any particular metal structure, whether it is of ingot or of an aircraft part, or as I mentioned before, of a high pressure boiler, the only tests which were available before the use of x-rays were destructive tests. In other words, the metal had to be torn down, polished, etched, or otherwise taken apart in order to get to the inside of its structure. However, with x-rays we are able to get to the inside of the structure without destructive methods. Previous usages called for a microscopic or macroscopic examination, which naturally involved a filing down or polishing down procedure to get to the internal portions of the ingot.

Dr. Kelsey.—Is the x-ray examination that you referred to a routine procedure in manufacture?

Mr. Rose.—It is not a routine procedure inasmuch as we do not examine every ingot. However, what we have done is to standardize our procedures in preparing those ingots so we can count on a very high percentage of sound ingots to follow from good pouring and melting procedures. It is not routine in that we inspect every ingot. Occasionally we do take ingots out to check up on the efficiency of the man preparing the ingots, or of our melting and pouring procedures.

Dr. Sidney E. Riesner.—Since you suggest that the most efficient form of preparation for wire is reheat treatment and immediate quenching, would it be inadvisable to use stiffer wires, or wires that are co-worked or even tempered wires? Have such wires a definite disadvantage over the method you suggest?

Mr. Rose.—In answering that question, I might point out that fundamentally the use of annealed wire is the correct usage. As a metallurgist, I cannot too highly recommend the use of annealed wire; wire which has not been stressed to an extent which we are not capable of determining unless we can perform tests on representative specimens.

As far as your own individual techniques are concerned, I cannot give you any advice on that. All I can do is recommend, as a metallurgist, that you use metal which is in the normal unstressed condition; that is, in its annealed state. If your techniques are adapted to the use of wires which are in a stressed condition, cold-worked or heat treated, it is simply a matter of your own personal choice. However, I would not recommend from my limited experience with orthodontic appliances the use of such metal. I would recommend the use of annealed metal in every instance.

Dr. George W. Grieve.—As you have just stated, I agree with you that annealed wire is to be preferred. However, can we re-establish or build up the temper in that wire by the use of the ordinary blow pipe, for instance, or a simple method of temperature regulation?

Mr. Rose.—You are undoubtedly familiar with the methods of hardening wires through procedures such as air cooling or oven cooling. As I suggested before, that may be done, and it is only a matter of your personal technique as to which you like to use.

Dr. Harry E. Kelsey.—As a metallurgist familiar with these types of metals, do you think that from your standpoint it would be better procedure to have a wire that was not greatly affected by the heat treatment, or by annealing, etc., in other words one that maintains

about the same stiffness through all conditions? You cannot put in as much temper and as much spring as you can in those wires which are capable of temper through heat treatment, but do you think that it would more likely give more satisfactory results if you had a sufficient spring in it to do the required work?

Mr. Rose.—Yes, I think you have a valuable point there in one respect. We are endeavoring to provide wires which do harden at a certain rate, and as I suggested before, we are trying to find wires for orthodontic usage which do not harden at too great a rate. As I showed on one of the slides previously, the excessive range of increasing stiffness with cold work on one of the wires made it completely unadaptable for use, and we try to keep that range of increasing stiffness with cold-work and with heat treatment down to a minimum. Unfortunately, however, the ingredients which go into an orthodontic material make up an alloy which must harden with cold-work.

COORDINATION OF OTOLARYNGOLOGY AND ORTHODONTICS

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MEDICINE is a general term applicable to the entire human body. Long ago, when medical and surgical knowledge was limited, one man attempted to do "general practice of medicine." But because of the rapid progress made in the last few decades, it has become impossible for anyone to do all the things necessary; therefore the specialties arose. Dentistry is one of these specialties of medicine; it has its own subdivisions or subspecialties. Dentistry has made very rapid progress during recent years, but it is only now being accepted as an important specialty of medical science.

Our subject today deals with the coordination of the work of the otolaryngologist and that of the orthodontist. In order for a better coordination of these two specialties, it is necessary that each should know more about the other. Each should be conversant with the problems of the other. There is an apparent lack of understanding on the part of the otolaryngologist as to the need of orthodontic assistance in many of his patients. He has not been taught the value to be derived from such procedures. He looks at the patient's teeth, but only for caries or with a consideration of the wisdom teeth in mind, or seeking a possible focus of infection. He usually knows very little about malocclusion, and, therefore, gives very little attention to this condition. The otolaryngologist should be in a position to refer many children to the orthodontist. He sees patients for ear, nose, and throat disturbances—some because of nasal obstruction or enlarged tonsils and adenoids which present definite orthodontic problems. We as otolaryngologists should recognize these and give proper instructions to the patient and to the parents. On the other hand, orthodontists see patients for only one primary reason, crooked teeth, with their many and varied manifestations. Perhaps they are more alert about recognizing and referring otolaryngologic conditions to the ear, nose, and throat specialist. They should realize, and I believe they do, that etiologic factors arising in the nose and throat should be removed. They know that better and more permanent results are obtained when these factors have been eliminated.

There are several etiologic factors bearing upon malocclusion that are commonly observed in the normal practice of any otolaryngologist. Some of these are definitely in the hands of the ear, nose, and throat specialist long before the orthodontist sees them, but many of these patients should receive cooperation of these two specialties. I call attention to a few conditions which, in my judgment, should demand both the attention of the otolaryngologist and the orthodontist.

First place should probably be given to nasal obstructions. All cases of malocclusion associated with nasal obstruction present problems of interest both to the otolaryngologist and to the orthodontist. These cases should have the

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closest cooperation on the part of both. The common result of nasal obstruction is mouth breathing, with the consequent deformity and symptom complex which it produces. Several etiologic factors are involved in the term nasal obstruction, and each should receive brief consideration.

Perhaps enlarged tonsils and adenoids should be considered first because of their frequency, and because they occur in the early formative period of the child's life. We are all more or less familiar with the symptom-complex produced by enlarged adenoids and tonsils, namely the "pinched-nose expression," short upper lip, protruding maxillary incisors, and frequently the overbite. This picture, together with the open mouth, presents a more or less characteristic appearance. There may be differences of opinion as to how malocclusion is produced in such cases, but all agree on certain corrective measures. The mechanism is practically the same in whatever type of nasal obstruction we may encounter. The fact that the child is breathing through his mouth perhaps is the underlying reason for the malocclusion, and its consequent symptoms. I believe there are several factors that combine to produce the effect upon the teeth. First, we have the abnormal motions and habits of the tongue pressing as it does against the maxillary incisors and against the palate, so commonly observed in these cases. Second, because of the open mouth we notice the relaxed condition, particularly of the orbicularis oris muscle incident to the relaxed condition of the lips. This prevents a normal opening, closing, and working of the mouth and lips, which prevents the normal pressure that would ordinarily be used against the maxillary teeth. Because of the pressure from within by the tongue, the teeth protrude. Third, perhaps all the muscles of the mouth and fore part of the face are relaxed, even the muscles of mastication, which accounts for the peculiar facial expressions and possibly the abnormal position of the teeth. Fourth, the shortened upper lip incident to mouth breathing and the open mouth deprives the upper incisors of the normal pressure that should be exerted by the muscles of the lips, thus allowing them to protrude.

It is the realm of the otolaryngologist to remove these etiologic factors. Most parents are now aware of the ill effects of enlarged tonsils and adenoids, but too often damage has been done before corrective measures are instituted. These cases should be referred to the orthodontist after nose and throat conditions have been eliminated.

There is another type of deformity and malocclusion produced in a peculiar effort to get sufficient air. The chin is made to protrude. It is tilted forward, and there is an upward tilt due to a backward position of the head. This chronic position produces a definite malocclusion of the front teeth, the lower being forward. In this type of case another type of deformity is frequently noted. It is a forward angling of the cervical vertebra at about the third and fourth joint, produced by the forward position of the head on the cervical spine. I recently had such a condition in a 6-year-old boy. At the time the tonsils and adenoids were removed, it was almost impossible, by the drop method, to give him sufficient ether to induce normal anesthesia. He could get no air through his nose and very little through his throat. The boy had a definite "pigeon breast" type of chest. I have advised them to have his teeth cared for.

The second important cause of nasal obstruction is the deflected nasal septum. This cartilaginous and bony partition may be so deflected or knuckled to one side or the other that it produces a chronic obstruction. If one side is blocked by deflection from the perpendicular, it usually leaves the other side wider than is normal; then nature, in her effort to equalize the column of air on the two sides, enlarges the inferior turbinate on the wide open side which completes the blockade. Many of these cases are due to direct injury; others have no known cause. In order for a deflected septum causing nasal blockage to produce great changes in facial expressions, or to influence proper occlusion, it must occur in early life. Most of these cases will be seen first by the ear, nose, and throat specialist. He should immediately recognize the problems involved. The nose should be opened with the proper method applicable to the age of the child. A complete submucous resection is seldom done before thirteen or fourteen years of age, but cartilage can be molded and left in situ, to produce sufficient space for nasal breathing in children under this age. After this has been done the orthodontist is in position to aid materially in the problem of malocclusion.

A third condition is that of narrowed nose and narrowed nasal passages. This condition may exist without an associated high palatine arch, but the two are commonly associated. Myerson[1] points out that nasal obstruction does not produce a high palatine arch. Probably that is true, but on the contrary, I believe we can trace nasal obstruction to high arching of the palate. There are two possible mechanisms by which the blocking is produced. First, the congenital high arch is, in general, associated with a narrow nose and nasal passages; second, the acquired high arch which results from pressure on the palate, as by a thumb or pressure from the tongue. Either of these types may produce sufficient pressure upward to cause a deviation of the cartilaginous septum sufficient to block space, because the passages are already narrowed. These cases frequently present the protruding type of malocclusion which belongs to the realm of the orthodontist and should be promptly referred to him. By proper appliances placed on as early as possible, consistent with dental development, these arches can be widened and the vault of the arch lowered which may possibly produce a widening of the nasal passage and can surely produce a greater vertical height of the nasal space. Some of these cases should have the nasal septum straightened before orthodontic treatment is begun and result obtained should be properly evaluated.

A fourth cause of nasal obstruction is that of chronic sinusitis. It produces a chronic congestion of the mucous membrane of the nose and chronic enlargement of the turbinates, which in turn produces a chronic nasal obstruction. Sinusitis is of very frequent occurrence, even in children, and if allowed to become chronic during the first years of life, may produce the same type of mouth breathing and malformation that enlarged tonsils and adenoids produce. If these children are neglected during this period, they may first come into the hands of the orthodontist at the age of ten or twelve years, for a consideration of having their teeth straightened. He will immediately recognize that these patients should have the nasal passages cleared, either before his treatment is begun or simultaneously with it. Results will be much better.

Allergy in early childhood undoubtedly plays an important part in the production of nasal obstruction, and therefore mouth breathing and malocclusion. It is certain in these cases that orthodontic treatment is more effective provided the allergy is overcome, or at least the nose is kept open. In most localities, treatment of allergic conditions belongs in the realm of the otolaryngologist. The allergic rhinitis must be cleared by means of pollen extracts, food corrections, drugs, which are often only temporary, or if need be, a change of climate during the severe hayfever season. This will allow full effect of the orthodontic appliances.

This discussion would hardly be complete without mention of the temporomandibular joint syndrome. We are indebted to Dr. James Costen[2] of St. Louis more than any other for calling this condition to our attention. We are not entirely sure just what part the orthodontist should play in these cases, but possibly some are due to crooked teeth, but most are due to the fact that certain teeth, particularly the molars, have been extracted which produces a lack of proper occlusion on one side. The symptoms produced are at first entirely mechanical and referable to the temporomandibular joint only. Most patients interpret the pain as being in the ear. This pain is produced by excessive pressure in certain areas of the articular cartilage. It is produced mechanically by the pull of the muscles of mastication which produces a twist in the joint mechanism, because of a lack of occlusion on the particular side involved. Occasionally the opposite joint will also be involved because of the twisting of the jaw. These cases if treated early can usually be relieved by proper dentures or by producing a proper occlusion. If allowed to continue, permanent damage may be done, even the ear canal may be gradually flattened and this interfers with hearing. It is possible also to erode the roof of the joint cavity and thus set up a meningeal irritation which may give rise to vague but chronic pain over this side of the head. Cases with mandibular joint pains should have a proper dental examination with special references to occlusion. I have had a number of these cases which have been completely relieved by proper attention to the teeth. However, occasionally a patient complains of jaw joint pains that are not traceable to the teeth. Arthritis occasionally involves this joint, and must be treated as arthritis in other joints.

There are a few other conditions which are of interest both to the otolaryngologist and to the orthodontist. Thumb-sucking in early childhood presents a very difficult problem which demands the closest cooperation on the part of all concerned, parents, pediatricians, otolaryngologist, and later the orthodontist. Too often parents pay no attention or even encourage thumb-sucking because it keeps the child quiet. All forces should combine to teach parents the bad end results of such habits. In my experience, once the habit of thumb-sucking is well established, it is very difficult to overcome before the child is two years of age. After that time it is very easy with aluminum mits or some similar appliance, but even then the closest cooperation with the parents must be had. Of course thumb-sucking occurs and the occlusal damage has been done usually before the orthodontist sees the child, but, to me, this is another case where proper instruction by pediatricians or otolaryngologists could promote preventive measures and avoid the need of the orthodontist. However, many cases

are not avoided and, therefore, should be referred to the orthodontist at an early age to prevent permanent malposition. He can determine when to apply braces and begin the long task of correcting malocclusion. The effect produced by thumb-sucking is purely mechanical, pressure upward on the palate and a forward pull on the maxillary incisors.

Another condition is that of pressure with the tongue against the maxillary incisors. This is usually incident to nasal obstruction and mouth breathing, but is frequently sufficient to produce an open-bite. Because of the apparent insignificance of this habit of the tongue, parents are prone to overlook the possible effect; therefore, most of these cases will be observed by the orthodontist before the otolaryngologist. Again, if the otolaryngologist sees this type of patient first he should have proper consulation with the orthodontist. Only by opening the nose and allowing normal nasal breathing and the proper application of braces can the deformity in these cases be relieved.

I merely mention cleft palate and harelip in this connection, because they produce serious malformation of the mouth and teeth, and because a fair number of otolaryngologists do harelip and cleft palate operations. Most of these cases are operated very early in life and perhaps consultation with the orthodontist could have little significance, but occasionally one is not operated so early. I believe proper consultation on the part of the orthodontist and the surgeon involved, whether he be an oral surgeon or otolaryngologist, would be for the betterment of the patient.

This paper would not be complete without a brief consideration of fractures of the jaw, both maxilla and mandible. Many of these cases are seen by general surgeons in the routine of taking care of accidents and emergency cases that come to them. Some are taken care of by the otolaryngologist. Both the surgeon and the otolaryngologist have a fairly good idea of bracing such fractures and even wiring them when necessary, and it is their jurisdiction to look after proper sepsis, but they have little knowledge or conception of proper occlusion. Perhaps it is not the realm of the orthodontist to look after these cases completely, but because of his familiarity with appliances, splints, and braces, and because of his knowledge of proper occlusion, he should at least be called in consultation in most of these cases. It usually takes several weeks to complete the care of one of these patients. During this healing process the orthodontist may be able to bring teeth into proper alignment and proper occlusion, whereas if left to the judgment of the general surgeon or the otolaryngologist there may be some malalignment. Therefore, proper cooperation of the two specialties in these cases will be an advantage to the patient.

I thank you for the opportunity to appear on your program, and I hope these two specialties will become better acquainted in order that we may cooperate more and better, always to the best advantage of the patient involved.

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THE DENTAL PREPARATION OF ASPIRANTS TO THE UNITED STATES MILITARY ACADEMY

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THE dental preparation of aspirants to the United States Military Academy is a problem all too frequently reserved for the period just prior to the applicant's eligibility for the academy, the results of which end in regrets and misunderstandings. Oftentimes great sacrifices have been made by the parents to send the boy to a preparatory school—sacrifices certainly not justified when, upon physical examination, the boy is found hopelessly disqualified because of poor dental condition. It is not my purpose to judge, nor to evaluate, the degree of neglect by the persons responsible for these situations that occur every year; rather the object of this paper is to appeal for judicious consideration of our problem by parents, civilian dentists, and military dentists.

We cannot expect to consider intelligently any problem until that problem is clearly stated in its entirety. How then can we expect to find our problem solved at the time of the entrance examination unless all persons are fully aware of the exact dental requirements for entry? Regulations are not to be hidden away in secrecy but are to be aired frequently for the advantage of all those concerned with the dental preparation. Many civilian dentists have no knowledge of the requirements, nor any ideas as to the procedure for securing that information so vital for the welfare of the patient. It is, therefore, without apology, or reservation, that I list the dental requirements:

"(2) Teeth

(a) *(Omitted)*

(b) No candidate will be accepted unless he has a minimum of six serviceable vital masticating teeth (bicuspids and molars) above, and six below, serviceably opposing, and also four serviceable vital incisor teeth (incisors and cuspids) above and four below serviceably opposing. In cases in which insufficiency of teeth may be remedied by the eruption of third molars, an x-ray of the third molar region will be taken. If a normal third molar properly positioned and developed is shown, it may be assumed that it will have a normal eruption and the candidate may be credited with possession of this tooth . . .

(c) Vital teeth properly filled with permanent filling material, or well crowned, will be considered serviceable if otherwise acceptable. A single tooth replacement by a standard method of bridgework will be acceptable in lieu of a serviceable vital tooth when the abutment teeth are otherwise acceptable and the bridge is well constructed.

(d) A tooth will not be considered serviceable if—

1. It fails to enter into serviceable occlusion with an opposing tooth.
2. It has an unfilled cavity.
3. It supports a defective filling or crown.
4. It is non-vital.
5. There is destruction of the supporting tissues of the tooth, such as results from gingivitis, pyorrhea, etc.

(e) Causes for rejection are—

1. Failure to meet the standard of minimum requirements outlined in (b) above.
2. Loss of three adjoining masticating teeth in either side of the upper or lower jaw.
3. Disfiguring spaces between anterior teeth.
4. Marked irregularity of the teeth.
5. Marked malocclusion.''*

It must be remembered that these regulations are not rigid, unvariable laws in themselves, but are flexible in that individual variations in interpretations of them do occur. These regulations are also subject to changes as recommended by The Chief of the Dental Division through The Surgeon General's Office.

Inadequate preliminary examinations, probably resulting from lack of consideration, by the military dentists, are responsible for many complications developing at the time of the entrance examination, and lead to the necessity of attempting to secure authority for waiver of dental deficiencies.

A solution for meeting these requisites comes through the co-ordinated efforts of parents and dentists. Parents must participate in the solution by formulating in the child's mind an early decision for the Academy, because the time element is one of the greatest factors, either complicating or making it impossible for the dentist to do his part in the preparation. Suggestive psychology by the parent can stir the child's interest in the preservation of teeth and induce a desire to cooperate with the dentist who is going to make it possible for the dental examination to present no barrier against West Point. The minds of children are very receptive to outside stimuli, therefore parents must be certain the stimulus is of the correct kind and performed in a manner to develop the desired results. It is far better to guide the thought for the child than to try to forcefully thrust it down his throat and make him swallow it. This thought holds especially true for parent supervision in that: (1) dental appointments are kept promptly by the patient at regular intervals and not postponed for trivial reasons, and (2) oral hygiene instructions are to be followed as given by the dentist.

Civilian dentists and military dentists are to solve the problem by examining the oral conditions, evaluating the occlusion, and instituting corrective measures for deficiencies found. The military dentist must in addition accurately estimate the dental situation, first at time of the preliminary examination, and second, at time of the entrance examination, and conscientiously give a full recording of the condition on W.D. AGO Form No. 0164. Likewise, he must not fail to render recommendations for corrective measures possible. It is extremely important to convey this knowledge to the parents and to the dentist in whose care the patient has been placed. When applicants are rejected, the military dentist must forward to The Surgeon General's Office models and x-ray pictures pertinent to the condition constituting cause for rejection. Personal pride in one's work should prompt him to send forward models accurate as to detail and properly carved, also x-ray pictures from which an intelligent interpretation can be made. We should remember that by slighting these details we might be keeping some worthy and capable boy from securing a waiver for the dental condition found.

*Army Regulations 40-100, C 3, "Standards of Miscellaneous Physical Examinations," Dated: June 15, 1937.

A broad concept of our part as dentists has been given for the purpose of orienting ourselves in this problem. We must realize that the basis of the solution lies in preventive measures to be instituted at the earliest possible time . . . the burden of which lies directly upon our shoulders. Keeping in mind our goal, a detailed discussion of possible preventive measures will be given.

No single thing can make dental treatment more effective than a thorough knowledge and understanding of child psychology. It is through this means that more definitive and satisfying treatment can be given, and a more certain realization that preparation of the applicant will be accomplished. There are many publications concerning the types of child patients and how each should be handled; however, I see little difference in the manner of handling children and that of handling adults. The management of either calls for a respect of the patient's intelligence, a firmness in purpose, and some definite goal accomplished at each sitting. The best way to deal with children is to treat them as adults, and respect their individualities. Teagarden* has given two basic requirements for the successful handling of children: (1) good sense, and (2) the ability to feel one's self into another person's situation.

It seems self-evident that the general oral condition can be improved by prophylaxis, instruction, and insistence on oral hygiene, and suggested diet modifications if indicated. Loss of teeth in excess of the minimum requirement can be prevented by: (1) thorough examination, (2) treatment of incipient caries and extensive caries, (3) utilization of partially impacted third molars, and (4) suitable one-tooth replacements.

How pathetic it is that teeth have to be extracted because some one failed to discover an obscure cavity. These dental examinations are not to be taken as an unpleasant duty to be hurriedly disposed of in the quickest possible manner. We must look at these mouths with our eyes and brain. Dental caries cannot be detected with dull explorers and mirrors so scratched that even light cannot be reflected from them. As the visual field is improved, so is the detection made simpler. Use binoculars or loupes, and then don't expect to see much unless the teeth are dried of saliva and cleaned of mucin by the use of alcohol and the air blast. Bitewing films should be made of at least the posterior teeth, and questionable areas thereby discovered should be re-examined, by actual separation with an ivory or other suitable separator, to confirm your x-ray interpretation. The examination procedure must be systematic and standardized for each individual operator's convenience, because without such a method errors and false interpretations or conclusions must necessarily occur.

We all must agree that treatment of incipient caries is of absolute necessity, but the controversy arises when the question as to what constitutes a cavity is asked. Do we need a more concise definition as to what constitutes a "cavity"? Could we intelligently say that all explorers used in examining should definitely catch a #36 Brown and Sharp Gauge, and that any crevice in the tooth so engaged by such an explorer should be considered carious? No, I do not think that this would be rational. I do believe that questionable areas that show actual breaks or loss of tooth substance must be considered potentially carious and treated accordingly. Small breaks in the continuity of the enamel surfaces

*Teagarden, Florence M.: *Child Psychology for Professional Workers.*

in deep fissures are often found at the time of the entrance examination. These defects have either been considered noncarious, or have been overlooked by the attending dentist. It is an embarrassing situation for the dentist, who has supposedly placed the teeth in the best possible condition, to have the patient return with the statement that cavities have been missed. These confusing reports could be eliminated by the use of sharp explorers, and by the precaution of cleansing and drying the teeth as I have outlined.

The treatment of rampant caries is a problem even when the time element is not a factor. How much more complicated it becomes when the treatment must be completed in a period of time often far too short of that necessary. The most satisfactory method of accomplishing the preparation of these patients consists of arresting the decay in the teeth, according to their degree of involvement, by use of a temporary palliative filling. Nothing permanent is done until all seriously involved teeth have been cared for in this manner. The preference is then reversed for the insertion of permanent fillings, thereby allowing a maximum lapse of time between insertion of the palliative treatment and permanent filling.

The question of when to extract first permanent molars with pulp involvements has been given much thought by the leading men doing children's dentistry. Hogeboom has listed the rules given, for teaching purposes, by Dr. Lawrence W. Baker, of Boston. They are as follows:

> "Group 1. Before the eruption of twelve-year molars.
>
> Rule 1. When one, two or four six-year molars are broken down and pulps exposed, before the eruption of the twelve-year molars, extract the molar or molars in question. In case three six-year molars are so diseased, extract all four molars."
>
> "Group 2. After the eruption of twelve-year molars.
>
> Rule 2. When one or more six-year molars are broken down and pulps exposed, after the eruption of the twelve-year molars, save six-year molars if possible; otherwise, extract unsavable molar or molars and supply the full mesiodistal diameters. This procedure will prevent tipping of twelve-year molar or molars."*

Like all rules, these should not apply to all cases, and should call for the exercise of good judgment by the dentist.

Much thought should be given to the condition of pulp involvement. Even though a nonvital tooth cannot be counted as a serviceable tooth, oftentimes a root canal filling is indicated rather than an extraction. There can be no hard and fast rule established as to when we should treat and when we should extract such teeth, but for anterior teeth, whose apices are fully calcified, every indication should lead to a root canal filling.

The utilization of partially impacted third molars is a subject of which we are gradually realizing the importance. Evidence of this fact is appearing in our dental journals from time to time. In reviewing these articles, I could find no better solution to the problem than that given us by Lt. Col. Siefert. This method consists of using ordinary brass ligature wire to gain separation and sufficient space to allow eruption of the impacted tooth. The one requisite of this method is the ability to pass the wire beneath the contacting surfaces of

*Hogeboom, Floyde Eddy: *Practical Pedodontia or Juvenile Operative Dentistry.*

the second and third molars. By twisting the ends of the loop thus formed, the third molar is actually squeezed back and its contact freed. The patient must be seen at regular intervals and the separating wire kept tight at all times. When the tooth has moved distally so far that this initial wire pulls through the contact, wind two wires upon each other and proceed as before. The degree of distal movement is varied by the number of wires wound upon each other. Such a technique is simple, easy to do, and yet very effective. It is also adaptable to similar conditions of other tooth impactions.

In constructing suitable one tooth replacements, we must not lose sight of the fact that the vitality of the abutment teeth must be preserved at any cost. It is my opinion that permanent fixed bridges are not indicated for the majority of patients of this age group. It would be far better in most cases to postpone definitive treatment until a later date. Teeth can be replaced temporarily by the construction of a horse-shoe denture, or by using orthodontic bands on the teeth adjacent to the space, and soldering a Steel's backing and facing to these bands. Any method that conserves the vitality of the abutment teeth, retains the space, and satisfies esthetics should be considered a satisfactory replacement for a patient of this age.

It is often possible to take simple corrective measures to prevent disfiguring spaces in the anterior region due to insufficient space for eruption of anterior teeth, or to an abnormal labial frenum. Additional space for eruption of anterior teeth can be easily gained by a simple method. The method is used when only minor corrections are needed for neutroclusion cases. The procedure can best be described by a discussion of two specific situations:

1. Large space between two maxillary central incisors, neither of which is on midline, resulting in insufficient space for eruption of lateral incisors.

A double wrapped steel ligature is placed around each central incisor for the purpose of preventing our secondary ligature from creeping gingivally upon application of pressure, and also to insure the pressure being exerted at the correct point. The secondary ligature encompasses both central incisors, and when tightened, pulls them together so that both are on the midline, and have moved creating a space sufficient for the eruption of the lateral incisors.

2. If, however, the condition is unilateral wherein one central incisor is already on the midline, and the adjacent lateral incisor has erupted, these two teeth must be ligated against the one central which is to be moved.

This procedure is equally as effective for creating sufficient space for the eruption of cuspids, and bicuspids.

Evaluating the occlusion is one of our most important functions. The ability of determining "if and when" orthodontic treatment should be instituted should be possessed by all dentists. We must also be able to differentiate between normal and abnormal during the stages of deciduous, transitional, and permanent dentitions. In making the determination, we must keep in mind that physiologic age of the patient is more important than chronologic age, and that a variation of normality in different individuals exists. For these reasons, no definite or specific time, that will fit all occasions, can be given to begin treatment. The time for treatment is of lesser importance than is the diagnosis of the condition. Without doubt, the advisability of early treatment is of paramount importance; however, it does not always mean treatment by

orthodontic interference. The question is one of a bioengineering consideration best solved in consultation with the orthodontist. An extraction at the correct time, the breaking of a habit, myofunctional therapy, and the use of a space retainer all tend to prevent malocclusion, and become just as important as tooth movement by use of an appliance. We must recommend orthodontic consultations when malocclusion is evidenced by the following conditions:

1. In deciduous dentition stage by:
   a. excessive abnormal arch form
   b. open-bite
   c. cross-bite
   d. abnormal anterioposterior relation of arches . . . especially mesioclusions.
2. In transitional dentition stage by:
   a. constriction of arch form
   b. torsioversion of anterior teeth
   c. lingual eruption of anterior teeth
   d. cusp-interlocking.*

Since Class I (neutroclusion) cases present with more possibilities for simple corrections by the average dental practitioner, I believe that some of the etiologic factors should be listed:

Class I, type 1 (neutroclusion complicated by bunched anterior teeth).

Etiology

a. early loss of deciduous teeth
b. abnormal muscular habits
c. missing teeth, impactions
d. malnutrition
e. malfunction

Class I, type 2. Protruding maxillary, and retruding mandibular anterior teeth.

Etiology

a. protruding maxillary teeth:
   a. thumb, tongue, and lip sucking.
   b. mouth breathing caused by adenoids primarily, or by lack of lip function.
   c. abnormal muscle pressure.

CONCLUSION

When confronted with the problem of dentally preparing a patient for the rigid examination for West Point, we are obligated and must be equipped to render a proper diagnosis, to evolve a comprehensive plan of treatment, and to utilize every phase of modern dentistry in so doing. When examining, so examine and think of the existing condition as if you are the most critical examiner the applicant is to face. If you err in this direction, adjustments can be made; however, if you fail to record fully all that you see or are in doubt about, the time available for correction at a later date, when some other examiner discovers the condition, may be too short to accomplish the treatment.

The dental preparation of aspirants for the United States Military Academy begins long before eligibility and cannot be accomplished without the cooperation

*Moskowitz, Maurice: "Time to Begin Orthodontic Treatment."

of child, parents, and dentists. It is as important for the civilian dentist to realize the dental requisites, as it is for the military dentist to know and be able to act in a competent capacity upon them. Dental deficiencies necessitating rejection are largely preventable when ignorance and indifference can be substituted for good judgment, patience, and understanding. Rejections are the result of lack of preparation for the future. When each participant becomes fully aware of his responsibility, results must necessarily follow with satisfaction to all concerned.

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AN EASY AND INEXPENSIVE METHOD OF MAKING HAWLEY RETAINERS

W. B. Stevenson, D.D.S., Amarillo, Texas

Step 1.—The model is prepared by restoring bell to premolars and first molars which may have been destroyed when the impression was removed from the mouth. This is best accomplished by placing the back of the knife blade to the tooth and removing some of the plaster from the gingival third of the tooth. It is probably best to over-restore the bell, due to the fact that the model is to be tin-foiled.

Step 2.—The second step is the adaptation of the wires to the model, using any method and material one may prefer, but here I state my preference. I like to use an .025 chrome wire which lessens the probability of the patient's biting on the wire during mastication. I usually clasp both premolars on each side connected with a labial loop. These wires cross over the occlusal to be imbedded in the material on the lingual surface as illustrated in Fig. 3. The wires are then adapted to the model with the electric annealer. There are two welded joints which are reinforced with solder (Fig. 2.).

Step 3.—The wire is removed and tinfoil of .001 thickness is adapted to the model. Then, the wire is replaced and sealed into place by pressing the buccal and labial edges of the tinfoil around it, Fig. 1.

Step 4.—The acrilic is now ready to be mixed and adapted to shape on the model. Any powder and liquid will do, but you will find "Permaform" (Ransom and Randolph) to be very serviceable. One should begin by placing the mixing jar in a pan of hot water, so the jar will be warm, but not too hot to hold in the bare hand. A good measure for the powder and liquid is the bottle cap. One capful of liquid to four capfuls of powder is required for each model. It is spatulated until the spider webs form when the spatula is raised. The material is ready to be placed in the hand and rolled into an oblong mass. It is then placed on the model and pressed to form with the fingers. To prevent the material from sticking to the fingers, they should be kept moistened, or one should use pieces of wet cellophane, or rubber gloves. An excess around the margins and the height of the bite plane is desirable, since it is to be ground down to proper form.

Step 5.—The model is placed in the top of a double boiler, with water in lower boiler held to boiling point for forty minutes. NOTE: Do not put water in the upper part of the double boiler where the models are placed.

Step 6.—The model is removed from the double boiler and allowed to cool, after which it is ground to the thickness and height of bite plane desired. Additional grinding may be done after trying it in the patient's mouth.

Hints.—Do not polish the retainer. The material will not take a high polish. We find that the patients talk better and that appliances are as easily

Clinic presented at Southwestern Society of Orthodontists Meeting, Lubbock, Texas, Feb. 2 to 5, 1941.

kept clean, unpolished, as they are when finished with the vulcanite burr or the stone. Broken appliances may be repaired by drilling one or two small holes on each side of the break and then lacing with small ligature wire. This holds the break in correct position while it is being sealed with permaform liquid and left overnight to cure. Teeth may be added to the retainer to replace missing teeth until the patient is old enough for permanent replacement.

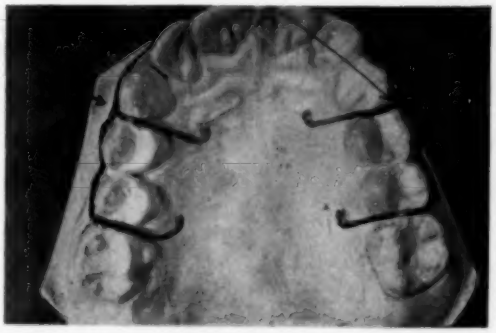

Fig. 1.—Wire adapted to model. *A*, points at which joints are to be welded and soldered.

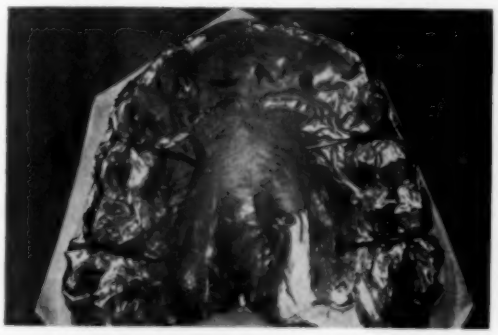

Fig. 2.—Model tin-foiled and wires sealed in place.

Fig. 3.—The finished retainer.

The cost of this type of retainer is small. The time consumed by the dentist will not exceed ten minutes to place and adapt the wires. The balance of the work can be completed by the assistant.

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The Height and Intelligence of Children: *Science* **92**: 10 (Nov. 29), 1940.

In an address before the meeting of the American Philosophical Society, Dr. Franz Boas, professor emeritus of anthropology at Columbia University, declared that, "Children short for their age had an intelligence quotient markedly under the norm, those tall for their age, one above the norm." This finding is corroborated by the statistical evidence of another investigator, who found that "children of the same age are the taller, the higher the grade they had attained in school. In other words, their physical and mental development went hand in hand."

Great variability in human stocks, even in fairly closely related groups of individuals, was another point discussed by Dr. Boas. Variable traits included not only the obvious physical characters but also physiologic and mental ones. "The genetic lines composing a race are so varied that the assumption that all members are by heredity endowed with the same physiologic and mental characteristics is as absurd as to claim that they are physically alike."

The First Permanent Molar Again. By A. A. Wilkinson, M.B., Ch.B., L.D.S. *British Dental Journal* **64**: 269 (Oct. 15), 1940.

According to Wilkinson, on completion of the dentition more than 99 per cent of Anglo-Saxon mouths are overcrowded, however much expansion is done. Therefore, routine treatment should be directed toward the prevention of overcrowding and its results by reducing the number of teeth that the adult mouth is allowed finally to accommodate.

The results of overcrowding in the mouth, says Wilkinson, are irregularity of the teeth, which is the cause of malocclusion, with possibly impacted third molars to follow, caries, especially interproximal caries, and pyorrhea. Wilkinson has been advising all parents to allow the removal of four of their children's permanent teeth, in order to prevent crowding and caries. He has done this, in several hundred cases, and never had subsequent reason to doubt the wisdom of this plan. In all cases where permission to extract was refused by the parents, the results of overcrowding manifested themselves.

By a process of elimination, Wilkinson came to the conclusion that extraction of the first permanent molars gave a result in nearly every case that was so strikingly different from that achieved by any other procedure, that he decided to adopt this treatment as a routine unless there were strong contraindications.

In the majority of cases, if the extraction of the six-year molars was done at the most advantageous time, Wilkinson found the teeth well spaced and regular, with entire absence of decay anywhere in the mouth in 60 to 70 per cent of cases. "I regret that my records do not permit me to state that these figures are quite accurate, but in claiming this percentage of immunity from caries, I am quite sure that I am erring on the conservative side," says Wilkinson.

One of the dangers of this treatment, the author points out, is closing of the bite. It does not occur very often, says he, but, if it does, it happens early and is very easily treated. The method of preventing closing of the bite found most successful is to give the patient a vulcanite plate which must be worn day and night, meal times especially, which takes the bite on the mandibular incisors and prevents the posterior teeth occluding. The length of time required for the posterior teeth to erupt into occlusion varies, but it should seldom be longer than eighteen months, and the plate can be thickened from time to time to raise the bite until one is satisfied with the position obtained.

If the extractions are done before the overcrowding has had time to damage the enamel, which always happens far earlier than one suspects, the majority of these patients may also go through life without caries.

In a number of cases Wilkinson has tried extracting the first or second premolars, and though this relieves an overcrowded mouth to some extent, it will be apparent that, as the first molar is from 10.7 to 12.5 mm. wide and the premolars are 6.9 to 7.3 mm. wide, the removal of the former gives much extra space. Further, the removal of the premolars is not followed by the almost entire absence of caries which is the happy result of the extraction of the six-year molars.

Irregularity of the teeth is, according to the author, in the majority of cases simply due to lack of space, which results in their being pushed out of their anatomically correct positions into positions which are incorrect and unanatomical. This lack of space is the result of the progressive diminution in size of the jaws while the width of the teeth themselves remains unchanged.

Practically all of the six-year molars removed are carious, and the great majority of those show multiple cavitation, which generally includes a decalcification of the enamel at or just below the contact point.

Wilkinson advises decrowding of the mouth in every case, for though there may be phenomenally rare cases in which this treatment does not appear essential in youth, he believes one can be sure that an overcrowded condition will develop in later years. Too much time will then have been lost, for late treatment will not produce the best results.

The widest possible variations occur in the dental development of children. The precise stage of development of the teeth should always be ascertained by x-rays, and the four six-year molars should be removed before the development of the roots of the second permanent molars has progressed far, roughly more than half way. If, on the other hand, a malalignment of the anterior teeth begins to manifest itself, the six-year molars should be removed forthwith.

The most fruitful source of failure of this treatment, and the reason why some practitioners condemn it and others are only half-hearted, is that usually

the extractions are not done sufficiently early. If they are deferred until the second permanent molars have erupted, there is a danger that these may tip, but tipping by no means always results from deferring the extractions. The best time to extract, according to Wilkinson, is between the ages of 8 and 10½ years.

"If the removal of the first permanent molars before the patients were 10½ was practiced by all dentists in the country, 90 per cent of the orthodontists would be out of work," according to Wilkinson.

"The greatest disservice that was ever done to the teeth of mankind," says Wilkinson, "was when Angle, whose pre-eminence as the father of orthodontics is unchallenged, described the first permanent molars as the very corner stones of the dental apparatus and declared that they were the most important teeth of all, of whose location Nature took the greatest possible care, and that their removal should never even be contemplated."

The author concludes that (1) Decrowding is absolutely essential in every case. (2) Unless there is an extremely strong contraindication, the removal of the first permanent molars always gives better results than any other form of decrowding. (3) Removal of these teeth in 60 to 70 per cent of cases results in complete absence of caries, absence of irregularity and absence of tendency to pyorrhea, always provided that the mouth has been carefully treated from early life, reasonable attention has been paid to diet, and the extractions have been done at the best possible time.

According to the data published by the reviewer* boys and girls 15 to 19 years of age show an increase of caries if their first molars are extracted over similar groups whose first molars are replaced. Distal drift of PM 1 and PM 2 in the maxilla is frequently even with mesial drift of M 2. The distal drift of the maxillary PM 1 and PM 2, as is indicated in the foregoing, is accompanied by loss of contact points without apparently sufficient separation of the respective teeth occurring to allow food debris to be freely removed from between these teeth, leading to increase in caries. Furthermore, in cases where the mandibular M 1 has been extracted, there is an elevation or continuous eruption of the opposing teeth and consequent loss of contact point in the maxillary teeth.

In view of these and other findings, one can hardly agree with Wilkinson that extraction of six-year molars is to be regarded as a method of treatment. To the contrary, extraction of six-year molars without subsequent orthodontic care is almost certain to induce malocclusion.

Numerical Variations in Greenland Eskimo Dentition. A Contribution to Comparative Racial Odontography. By P. O. Pedersen, with the assistance of E. Hinsch, *Acta odontologica Scandinavica* **1**: 93 (Nov.), 1939.

The present essay deals with numerical variations in the dentition of ancient and modern Greenland natives, as compared with those of various other racial and local groups. The material comprises three main groups, viz., (1) 525 ancient Greenland skulls; (2) 860 modern East Greenland Eskimoes, without any white admixture; and (3) 1,634 Southwest Greenland natives, principally hybrids.

*Salzmann, J. A.: Int. J. Orthodontia 23: 662, 1937.
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On examination of groups 1 and 2, roentgenograms were made in most cases.

The following variation in the number of teeth is dealt with separately for each main group of material:

Increase in number of teeth.—1.1 per cent of ancient Eskimo skulls, and 1.3 per cent of modern East Greenland Eskimoes had supernumerary teeth erupted or impacted; 0.8 per cent of modern West Greenlanders had supernumerary teeth erupted.

The increase in the number of permanent teeth was not found to be actually higher in the Eskimo than in white races. Nor has any reliable difference been found between the incidence of supernumerary teeth in the ancient and modern Greenland Eskimo and that of West Greenland hybrids of the present day.

Special attention has been paid to the occurrence of fourth molars from an evolutionary point of view. There is no evidence that fourth molars occur more frequently in the Eskimo than in the white man.

Decrease in number of teeth, with exception of third molar absence.—The character of congenital absence in the Eskimo dentition is very strange and distinctly differs from that of white population groups, whereas an appreciable resemblance seems to exist to that of the Mongolian stock.

In the Greenland Eskimo lower incisors are absent almost as frequently as are upper lateral incisors. Lower second bicuspids, frequently absent in whites, are very seldom found to be missing, and second and even first molars were found to be missing in a few cases.

Congenital absence of third molars.—This condition is very commonly met with in the Eskimo. The writer agrees with Goldstein, stating that an increase of third molar absence appears to exist from the southwest to the northeast Eskimo groups. The very highest range of congenital absence was found by the writer in the East Greenland Eskimo (skulls and living). White admixture seems to bring about a lower incidence of missing third molars.

Studies on dental numerical variations may prove of interest in connection with anthropologic and ethnologic research of the problem of racial origin of the Eskimo, as well as of the mutual relationship and migrations of various subarctic and arctic groups.

P. O. Pedersen.

Observations on **Children Hard to Handle.** By Gunnar Wollin, Temporary Director of the Eastman Institute, Stockholm, *Acta ondontologica Scandinavica* **2**: 62 (June), 1940.

The reason why a child is "hard to handle" may be nervousness or mental defect; such children are therefore sent from the department of operative dentistry to the pediatrician of the institute.

The resistance of the individual to treatment is not constant. It is often subject to changes which cannot be entirely explained by age and mental state, which influence the patient's resistance to treatment. The pediatrician may be of the opinion that medical treatment should precede dental, for instance, medicinal treatment, change of diet and external conditions in cases of nervousness, the supervision of a public institution, or even hospitalization.

Some think that it is advantageous from a psychologic point of view to bring together many children; others consider this to be a disadvantage. A screaming child influences the others negatively, however, quite as much as a "good" and cheerful child does positively. The best positive influence, therefore, is exerted on children generally by the removal of screaming children both from the waiting room and from the large operating room. Experience has shown that the children who most often scream in the waiting room are those of the preschool age with toothache. Emergency cases belonging to this category have a waiting room of their own. Again, if a child in the large waiting room cries or screams, it is taken to a separate room as soon as possible.

After a first treatment in a private operating room, the dentist often takes a stroll around the big room with the little patient, in order to show him how brave the other children are. In most cases it encourages the child to be told that "next time you will probably be allowed to sit here with the big children." Occasionally the child prefers the smaller room.

Only in exceptional cases is it advantageous to let anyone be present during the treatments. In the majority of cases it is a great disadvantage. As a rule, it is only in the cases of the youngest children under the age of 2 or 3 that it is advantageous to let the mother be present once or twice, until the child has had time to get used to the dentist.

In the department of operative dentistry, novocain-suprarenin and novocain-corbasil carpules are always available and are used as soon as the dentist finds that local anesthetics will be helpful in treatment.

It is only when the cavity preparation of the first permanent molars begins that local anesthetics are advantageous in certain cases. But not until the age of 12 or 13 years, do local anesthetics become really important.

The sensation of pain in the preparation of a cavity is not equally pronounced at the preschool age, as it is at the school and postschool ages; it seems to be the reverse with regard to shaking and pressure. "Do not press hard" is a request often made by the younger children. A method of technique adopted when attending to the "hard-to-handle" children, as well as to the timid type of little ones, is to let the first treatment be only apparent, and to let the first cavity preparation be as simple and painless as possible.

Diverting the child's attention, encouragement, flattery, explanations, kindness, firmness, bribes in the form of an empty box, a discarded mouth mirror, or something like that are means which often lead to the desired end. But it is not everybody's good fortune to be able to successfully apply these methods of influencing the child, and to perceive quickly and judge intuitively which of them will give the best result in a special case and on a particular occasion. From this it follows that a child may seem "hard to handle," or even to be impossible to treat, by one dentist, whereas the treatment may be effected without friction by another.

In the cases of both "hard-to-handle" and other children with certain exceptions, the dentist who begins the treatment completes it. Change of dentist or suspension of treatment was adopted on several occasions, with

satisfactory results, even in cases which have not here been classified as "hard to handle." On the average, a "hard-to-handle" child takes longer to treat than other children.

On Sources of Error in Radiographs of Canine Teeth of Man: By Gustaf Herulf, L.D.S., *Acta Odontologica Scandinavica*, Sup. Vol. 1, Lund, Sweden, 1940.

An analysis was made to determine the role of the various types of errors and their sources in roentgenographing canine teeth in the maxilla. Canines which had to be extracted were prepared in the following manner: a wire fitted with incisions at a distance of 1 mm. was introduced into the root canal and further applied to the labial and palatine outlines of the root from the cemento-enamel junction to the apex. The tooth was reintroduced in its place and roentgenographs taken. Each tooth was roentgenographed with the focal ray directed at right angles to the tooth, to the photographic plate and to the bisector with the focal ray centralized in the apex, in the center of the root and in the neck of the tooth. Double pictures were taken in order to measure the accuracy of the photographing method. Three instructors and thirty-four students made the roentgenographs.

On the basis of material obtained, it was found that errors were of two types: systematic and accidental. An individual tendency to make an inaccurate adjustment is a systematic error, and an unintentional variation of the adjustment is an accidental error. Accidental errors may also result from anatomic conditions causing unintentional displacements from the ideal position. Obviously these errors interact and are combined in various ways.

With regard to the systematic errors it was found that small disparities existed between instructors. The students, however, had a greater systematic deviation as compared to the trained groups. As regards the magnitude of the systematic error, it was found that a maximum shift of the angle of incidence may displace the length of the picture up to $\frac{1}{4}$ of the real length of the tooth, whereas a change in the centralized position brings about a considerably smaller effect, at most $\frac{1}{15}$. With regard to the accidental errors it is found that deviations are approximately the same no matter if the tooth roentgenographer is experienced or not. The accidental source of error is up to 4.5 mm. or approximately 27 per cent of the tooth length.

It was found that the following methods reduce the systematic deviation to a minimum and on an average correspond most closely with the real tooth lengths:

1. For the longitudinal axis, the isometric adjustment.
2. For the labial outline, the angle of incidence at right angles to the plate and the centralized position in the apex of the root.
3. For the palatine outline, the angle of incidence at right angles to the bisector, and the centralized position in the center of the root.

The accidental errors are unavoidable but they are least evidenced when the focal ray strikes the plate at right angles and also strikes the neck of the tooth.

L. L. Taft.

The Value of the Fundamental Sciences in the Establishment of Anesthesiology: By John S. Lundy, M.D. *Science* **92**: No. 2392, p. 388, November 1, 1940.

Anesthesiology has developed into a new specialty of medicine, as evidenced by the establishment of an Examining Board in Anesthesiology.

Many examples are given which show the dependence of anesthesiology on the fundamental sciences for its progress and for the solution of many of its problems. The author cites anatomy which teaches the location and landmarks of important blood vessels and nerve trunks in relation to local anesthesia, and teaches a knowledge of the respiratory passages in relation to general anesthesia.

Chemistry has contributed the discovery and synthesis of new anesthetic agents, and the means for detecting and determining the amounts of anesthetic agents in tissues and excretions. Physics, through its contributions to an understanding of physical principles in connection with gases and liquids, and through electrical physics, has been of much aid in the practice of anesthesia.

Pharmacology and physiology have been the proving grounds for agents and methods, which have passed thence into clinical practice.

Other sciences: bacteriology, botany, and horticulture are also mentioned. Even the study of languages is shown to be useful to the specialty of anesthesiology.

I. Neuwirth.

A Clinical and Pathologic Study of Oral Disease Based on 2,300 Consecutive Cases: By Francis P. McCarthy, M.D., *J. A. M. A.* **116**: Jan. 4, 1941.

The author, who is familiar with oral lesions because of his specialty and his association with the oral diagnosis clinic of a dental school, discusses oral lesions local in character and those with a systemic background.

McCarthy is not willing to accept oral galvanism as a factor in the production of lesions of the oral mucosa. He feels that lesions which have been attributed to electric currents can be explained by local irritation factors and other causes. He states that a high percentage of submaxillary and sublingual gland cysts (ranula) were associated with calculus either in the main duct or in branches in the parenchyma of the salivary glands. The mechanism of the production of lesions that manifest themselves on the tongue in late syphilis is explained by a sequence of pathologic changes. The most frequent malignant tumor of the oral cavity is the squamous-cell carcinoma.

A biopsy is necessary to differentiate between oral lupus erythematosus, erosive leucoplakia and the plaque type of lichen planus. Among the drugs capable of producing lesions in the oral cavity are phenolphthalein, the barbiturates, the iodides, and dilantin sodium. The hypertrophic gingival reaction in leucemia may offer a clue to the disease.

T. S. Cook.

Book Reviews

Surgical Anatomy of the Head and Neck: Second edition, by Barnhill, John Finch, M.D., F.A.C.S., LL.D. Cloth, Price $15.00, Pp. 773, with illustrations, Williams and Wilkins Company, Baltimore, 1940.

The title of Barnhill's monumental work, *Surgical Anatomy of the Head and Neck,* is somewhat misleading. Not only is the surgical anatomy carefully and comprehensively presented, but the book forms an excellent dissecting guide as well. In addition, surgical problems are considered from a practical clinical point of view. Every important point is emphasized and clarified by a wealth of drawings and illustrations, in color and black and white. These drawings were, for the most part, done by the author from fresh dissections, and because of their complete captions, result in a lucid elaboration of the text to an unusually remarkable degree. The subject matter is presented in the form of a series of clinical lectures in a style so vivid and interesting that one almost feels himself a member of the author's postgraduate group. This second edition of Barnhill's book, with its excellent index, should prove an indispensable addition not only to postgraduate students but to everyone engaged in the fields of otolaryngology and oral surgery. The publishing of the second edition still finds Barnhill's book the most outstanding work of its kind in this highly specialized field.

Harry A. Salzmann, M.D.

Editorial

Up to Now

The New York Society of Orthodontists recently held a program that comprised a historical review of its history up to now. This history makes very interesting reading for those who take a genuine pride and satisfaction in the background of drama, and intensive power that has been so characteristic of this specialty.

The progress of medicine is a shining example of what science can do for the human race, also of the extreme reluctance of the human race to accept what it has to offer, but the latter is not true of orthodontics. It is true that for many years the American death rate has been falling, and it is well known that this reduction has been accomplished in large measure by an enormous drop in the mortality rate for infants, one of the most spectacular pages in the entire history of scientific medicine, pioneered by a few intrepid stalwarts in pediatrics.

It seems extraordinary that a part of the human anatomy as small as the dental organs should enjoy such importance that they attract a profession to care for them nearly half as large numerically as the medical profession. Nonetheless it is true, and the record of attendance at the recent Chicago midwinter meeting and the evidence of its magnitude serve as a reminder that not only has mankind always taken its teeth seriously, but that it takes them so seriously now that a great and vigorous organized profession alive and alert to its responsibilities is ever on the watch for advance and progress as an important department of health service.

Orthodontics, however, has been the department not unlike pediatrics in medicine that has enjoyed a dramatic history of accomplishment for its real modern history started only at the beginning of the century and is as yet even a very new specialty of dental practice. Probably some of the earliest orthodontic interest was attracted by the old Swiss proverb that has it that if a boy's teeth are close together he will stay at home; if wide apart he will travel. In olden times it seems the loss of the teeth of the human organism was the all important news interest in life's span as related to the mouth at least. There is an old Hebrew law, so it is said, that provided that if a man knocked out the tooth of one of his slaves, the slave should go free. This was because the teeth were the instruments of life—those by which food is eaten—and it was no doubt assumed that a most miserable death by starvation awaits the man who has all his teeth knocked out.

There are many correlated interests now circumscribed about the teeth that are more modern in viewpoint; for instance, during the past decade obviously as a result of the wide attention attracted by the radio and news print, the public has become much more health and appearance conscious than at any other period since the world began. Much attention has been directed to the close relationship that exists between the teeth, the appearance, and the health of the

individual. From the esthetic standpoint alone, there is heard much on the air about "gleaming teeth and the smile," so much so in fact that happily now the public is highly conscious of the esthetic value of facial appearance, particularly as it is linked up with teeth and well-rounded symmetric dental arches. In fact, where the physical appearance is involved, nothing seems to reflect a long line of healthy ancestry quite so strikingly as a well-setup, rugged, and symmetric dental architecture.

The movies, no doubt, have been responsible for much of the change that has made the public so dental conscious. One knows that without the services of modern dentistry many of the present-day cinema stars would never have enjoyed a single twinkle because of discolored, missing, and unsightly teeth. Several famous movie stars of the current era owe their sightly teeth to the skill of orthodontists. It would seem hardly necessary to point out the great joy, satisfaction, and pride that the orthodontist must take in his job when he sees a smile appear on the screen that reveals the work of an artist in his line much as the highlights of an art gallery reveal the beauties of a painting by a great artist.

Such is the influence in an esthetic way at least of some of the efforts of modern dentistry. Suppose the finger of scorn is occasionally pointed at orthodontic history as being circumspect in its Class I, Class II, or Class III concepts; suppose it is criticized as being "rule of thumb" in viewpoint. Perhaps there is some basis for that criticism; notwithstanding, it is well to recall that there are but few departments of professional practice with only a handful of private but sincere painstaking workers, who have left within the last fifty years such a spectacular record of achievement for the physical benefit of childhood as has that of the department of orthodontics. With a record such as that, its faults should be written on the sands and its virtues shouted from the housetops in order that the urge of its workers in the future may be as intensive as has that of its patriots of the past.

To maintain this record of achievement in the future, orthodontics plainly does not need to worry so much about its lack of concept as it does about the fact that its past achievements and record may be absorbed in the mad whirl of a rapidly changing basis of professional practice.

In this transition orthodontics will, no doubt, continue to progress provided its past ambition for service is maintained and provided those who now are in charge of the orthodontic education of those preparing for practice are able to inject the same burst of enthusiasm, the same drive, into their students for the progress of the specialty as were the former teachers, many of whom have passed to their rewards. Up to now, it has been a fine record and if you are skeptical of that assertion, read the historical review of the New York Society of Orthodontists, published in the February, 1941, issue of the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY. It reveals an intensiveness that checks with the history of the specialty.

H. C. P.

News and Notes

American Association of Orthodontists

The Thirty-Ninth Meeting of the American Association of Orthodontists will be held at the Waldorf Astoria Hotel in New York City, May 5 to 8, 1941.

MAX E. ERNST, Secretary
1250 Lowry Medical Arts Bldg.
St. Paul, Minn.

Dallas Midwinter Dental Clinic

The Dallas Midwinter Dental Clinic, sponsored by the Dallas County Dental Society, will hold its fourteenth annual meeting at the Hotel Adolphus, Dallas, on April 21 to 23. This meeting will follow an all-day session of the House of Delegates of the Texas State Dental Society on April 20.

The study course will be presented by Dr. O. M. Dresden of Milwaukee, Wis., who will speak on "Prosthetic Dentistry"; Dr. Geo. W. Christiansen of Detroit, Mich., on "Oral Surgery"; Dr. W. Clyde Davis of Lincoln, Neb., on "Synthetic Porcelain"; and Dr. Fred Meyers of Minneapolis, Minn., on "Restorative Dentistry."

Cleveland Dental Society

The Spring Clinic Meeting of the Cleveland Dental Society will be held May 5 to 7, at the Statler Hotel, Cleveland.

American Board of Orthodontics

A meeting of the American Board of Orthodontics will be held at the Waldorf-Astoria Hotel, New York City, Saturday, May 3, 1941.

Orthodontists who desire to obtain certificates of qualifications from the Board should secure necessary application blanks from the secretary. Applications must be presented at least sixty days prior to the meeting. For further information, address the secretary.

HARRY E. KELSEY, President
CHARLES R. BAKER, Secretary
636 Church Street, Evanston, Ill.

Denver Summer Seminar

The sixth annual meeting of the Denver Summer Seminar for the study of orthodontics is to be held at the University of Colorado School of Medicine, July 28 to Aug. 2, inclusive. In accordance with Seminar policy to broaden the scope of the meeting and to include new leaders and material, Charles H. Tweed of Tucson, Ariz., and Isaac Schour of the University of Illinois will appear on the program for the first time this year. A prospectus outlining in detail the course of study for the coming meeting will be available in March to all who have specialized in the practice of orthodontics three years or longer. The Denver Summer Seminar is a nonprofit course conducted for practicing orthodontists.

Sigma Epsilon Delta Convention

The Sigma Epsilon Delta Fraternity will celebrate its fortieth anniversary on April 5 and 6, at the Hotel Pennsylvania, New York City. For further information write Dr. Dan Kollen, 24 West 59th Street, New York, N. Y.

Scientific and Health Exhibits of A. D. A.

The scientific and health exhibits will be one of the main activities of the annual meeting of the American Dental Association in Houston. Hundreds of face masks, natural colored photographs, paintings, models, instruments, specimens, microscopic sections, etc., will be available for study or review. These exhibits afford an excellent means of studying details of new methods or reviewing late advances.

Fluorides in Drinking Water

Fluorides in drinking water, which have been thought to cause "mottled enamel" of human teeth, may now be readily removed from the water according to a new patent, assigned to the Government by the inventor. The process employs magnesium oxide or magnesium hydroxide in comparatively large excess over the quantity of fluoride to be removed. It is said that the teeth may be affected when the concentration of fluoride, calculated as fluorine (F), is in excess of about 1 part per million in the drinking water. At least 100 parts of the magnesium compound should be used per 1 part of dissolved fluorine content; the magnesium can be used again and again until its activity as a fluoride remover is exhausted.

Dental Preparedness Committee

Returns from the Dental Preparedness Questionnaire from all states except Illinois, New York, and Ohio have been checked. According to the latest estimate this is only 60 per cent of the number mailed to dentists. This is not sufficient to permit the tabulation of accurate statistics or to warrant the publication of a dental directory. Dentists who have failed to return the questionnaire are asked to do so at once in order that the committee may complete its job.

Southwestern Society of Orthodontists

At a meeting of the Southwestern Society of Orthodontists held in Lubbock, Texas, the following were elected officers: President, E. Forris Woodring, Medical Arts Bldg., Tulsa, Okla. President-Elect, Hamilton D. Harper, Medical Arts Bldg., Shreveport, La. Vice-President, Harry H. Sorrels, Medical Arts Bldg., Oklahoma City, Okla. Secretary-Treasurer, R. E. Olson, Union National Bank Bldg., Wichita, Kan.

Dr. James D. McCoy of Los Angeles was the chief essayist and clinician. Papers were also presented by Col. J. B. Mann of the U. S. Dental Corps, Dr. F. B. Malone, and Mr. L. Langston.

Dr. A. B. Conly of Dallas won the golf tournament award.

Notes of Interest

Dr. Robert E. Gaylord announces the opening of his office for the practice of orthodontics exclusively at 34 Highland Park Shopping Village, Dallas, Texas.

Dr. E. C. Lunsford and Dr. H. K. Terry of Miami, Fla., announce their association in the practice of orthodontics.

Dr. Bruce A. Curran announces the removal of his office to 13210 Shaker Square, Cleveland, Ohio. Practice limited to orthodontics exclusively.

OFFICERS OF ORTHODONTIC SOCIETIES*

American Association of Orthodontists

President, Henry U. Barber, Jr. _ _ _ _ 5 East Fifty-Seventh St., New York, N. Y.
Secretary-Treasurer, Max E. Ernst _ _ _ 1250 Lowry Medical Arts Bldg., St. Paul, Minn.
Public Relations Bureau Director, Dwight Anderson
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 292 Madison Ave., New York, N. Y.

Central Association of Orthodontists

President, Harold J. Noyes _ _ _ _ _ _ _ _ _ 55 E. Washington St., Chicago, Ill.
Secretary-Treasurer, L. B. Higley _ _ _ _ _ _ _ 705 Summit Ave., Iowa City, Iowa

Great Lakes Society of Orthodontists

President, Frank S. Cartwright _ _ _ _ _ _ _ _ Henry Ford Hospital, Detroit, Mich.
Secretary-Treasurer, Richard E. Barnes _ _ _ _ _ _ Republic Bldg., Cleveland, Ohio

Harvard Society of Orthodontists

President, I. D. Davis _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 419 Boylston St., Boston, Mass.
Secretary-Treasurer, Edward I. Silver _ _ _ _ _ _ _ 80 Boylston St., Boston, Mass.

New York Society of Orthodontists

President, Glenn F. Young _ _ _ _ _ _ _ _ _ _ _ 745 Fifth Ave., New York, N. Y.
Secretary-Treasurer, William C. Keller _ _ _ _ 40 E. Forty-Ninth St., New York, N. Y.

Pacific Coast Society of Orthodontists

President, Will G. Sheffer _ _ _ _ _ _ _ _ _ _ Medico Dental Bldg., San Jose, Calif.
Secretary-Treasurer, Earl F. Lussier _ _ _ _ _ 450 Sutter St., San Francisco, Calif.

Rocky Mountain Society of Orthodontists

President, A. B. Brusse _ _ _ _ _ _ _ _ _ _ _ _ _ 1558 Humboldt St., Denver, Colo.
Secretary-Treasurer, Robert L. Gray _ _ _ _ _ _ _ _ Republic Bldg., Denver, Colo.

Southern Society of Orthodontists

President, Fred G. Hale _ _ _ _ _ _ _ _ _ _ _ Professional Bldg., Raleigh, N. C.
Secretary-Treasurer, T. C. Sparks _ _ _ _ _ _ 1508 Washington St., Columbia, S. C.

Southwestern Society of Orthodontists

President, E. Forris Woodring _ _ _ _ _ _ _ _ _ Medical Arts Bldg., Tulsa, Okla.
Secretary-Treasurer, R. E. Olson _ _ _ _ _ _ Union Nat'l Bank Bldg., Wichita, Kan.

Washington-Baltimore Society of Orthodontists

President, George M. Anderson _ _ _ _ _ _ _ _ _ 831 Park Ave., Baltimore, Md.
Secretary-Treasurer, Stephen C. Hopkins _ _ _ _ _ 1726 Eye St., Washington, D. C.

American Board of Orthodontics

President, Harry E. Kelsey _ _ _ _ _ _ _ _ _ _ _ 833 Park Ave., Baltimore, Md.
Vice-President, Frederic T. Murlless, Jr. _ _ _ _ 43 Farmington Ave., Hartford, Conn.
Secretary, Charles R. Baker _ _ _ _ _ _ _ _ _ _ 636 Church St., Evanston, Ill.
Treasurer, Bernard G. DeVries _ _ _ _ _ _ Medical Arts Bldg., Minneapolis, Minn.
William E. Flesher _ _ _ _ 806 Medical Arts Bldg., Oklahoma City, Okla.
Frederic T. Murlless, Jr. _ _ _ _ _ 43 Farmington Ave., Hartford, Conn.
Oliver W. White _ _ _ _ _ _ _ _ 213 David Whitney Bldg., Detroit, Mich.
James D. McCoy _ _ _ _ _ _ _ 3839 Wilshire Blvd., Los Angeles, Calif.

Foreign Societies†

British Society for the Study of Orthodontics

***President,* S. A. Riddett**
***Secretary,* R. Cutler**
***Treasurer,* Harold Chapman**

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*The Journal will make changes or additions to the above list when notified by the secretary-treasurer of the various societies. In the event societies desire more complete publication of the names of officers, this will be done upon receipt of the names from the secretary-treasurer.

†The Journal will publish the names of the president and secretary-treasurer of foreign orthodontic societies if the information is sent direct to the editor, 8022 Forsythe, St. Louis, Mo., U. S. A.